DUMONT

OSCILLOGRAPH RECORD-CAMERA

TYPE 352

Allen B. Du Mont Laboratories, Inc.
TECHNICAL PRODUCTS DIVISION

760 BLOOMFIELD AVENUE, CLIFTON, N. J., U. S. A.

DU MONT

OSCILLOGRAPH RECORD-CAMERA

TYPE 352

Allen B. Du Mont Laboratories, Inc.
TECHNICAL PRODUCTS DIVISION

760 BLOOMFIELD AVENUE, CLIFTON, N. J., U. S. A.

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ALLEN B. DU MONT LABORATORIES, INC.
Technical Products Division
Clifton, N. J.
U. S. A.

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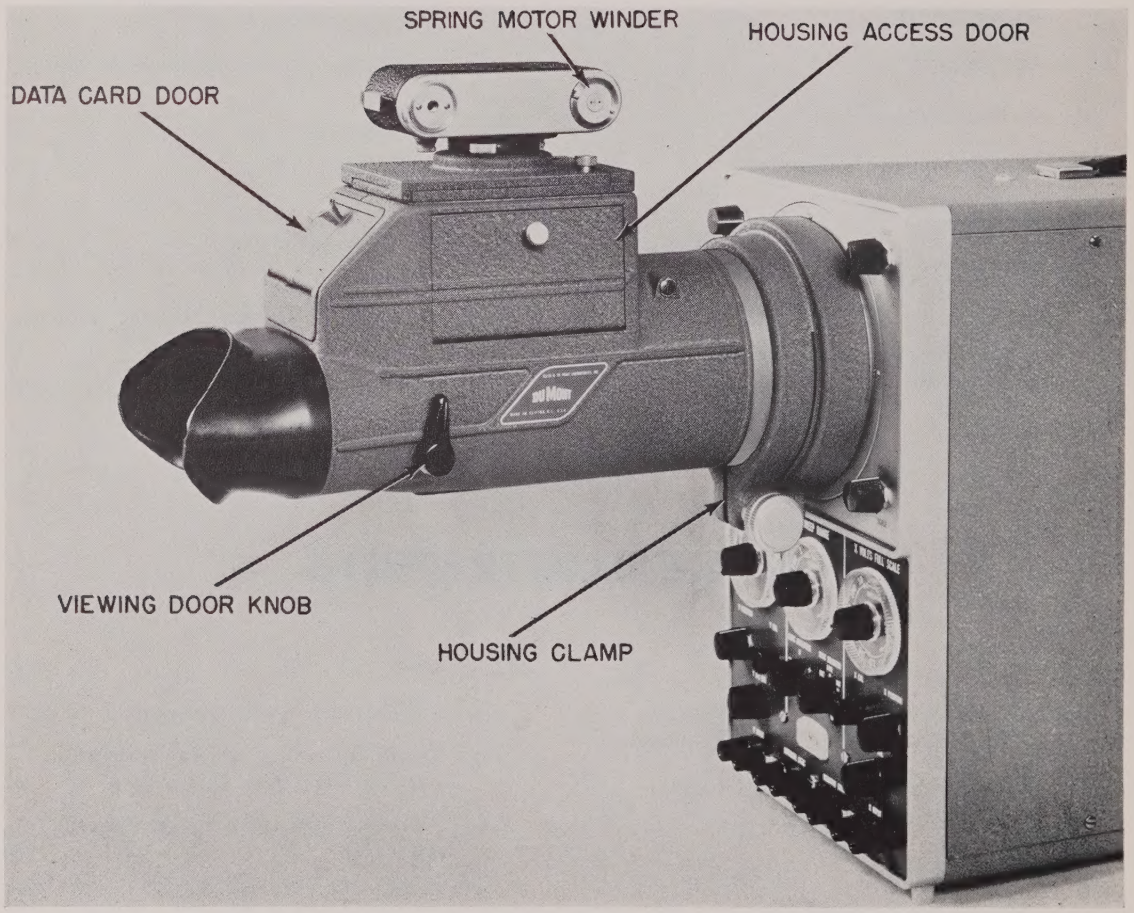

Figure 1-1. Type 352 Oscillograph-record Camera—Right Side

SECTION 1
TECHNICAL SUMMARY

1-1.	Film Size	Standard 35-mm perforated in either 20 or 36 exposure cartridges
1-2.	Negative Size	15/16 x 15/16 inch
1-3.	Object-image Ratio	4.7:1
1-4.	Lens	7 element 51 mm, apertures f/1.5 to f/22
1-5.	Shutter Selection	Bulb or the following exposures in seconds: (Sequence exposures shown red) 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/250, 1/500 Except for Bulb position, exposures may be made individually or in sequence automatically within the limit of the spring motor.
1-6.	Focus	Factory set and locked in place.
1-7.	Dimensions	Length—15-1/2 inches Height—9 inches Width—6 inches
1-8.	Weight	10 pounds

1-9. Accessories Available

Type	Title	Description
2632	Film Magazine	400 exposures available
2633	Spring Booster Motor	One to 60 frames
2634	Shutter Solenoid	110-volt operation, remotely controlled
2635	Electric Booster Motor	24-volt dc motor with 110-volt power supply, no limit to number of frames
2636	Take-up Cassette	Used to eliminate the need for immediate rewinding
2637	Right-angle Flash Cord	To make flash contacts available for synchronizing purposes
2623-A	Carrying Case	Houses the Type 352 Camera and some of the accessories

SECTION 2
DESCRIPTION

2. DESCRIPTION

The Du Mont Type 352 Oscillograph-record Camera is designed for photographing on 35-mm film the images obtained from the face of 5-inch cathode-ray tubes. The housing on which the camera itself is located is equipped with a clamp ring for mounting on the standard Du Mont cathode-ray tube bezel or its equivalent.

As the camera image plane is at right angles to the face-plate of the cathode-ray tube, a mirror is set in the housing below the camera lens. This mirror is a dichroic semi-mirror permitting direct viewing of the tube face through the mirror itself (see Figure 2-2). For a clearer view, the mirror may be swung up out of the way. The mirror frame is spring loaded so that it will always be returned to the proper position for picture taking.

A data card assembly is located above the rubber face mask. Opening the small door exposes the white writing area. Two battery-operated lamps are located behind the protective glass plate. A push-but-

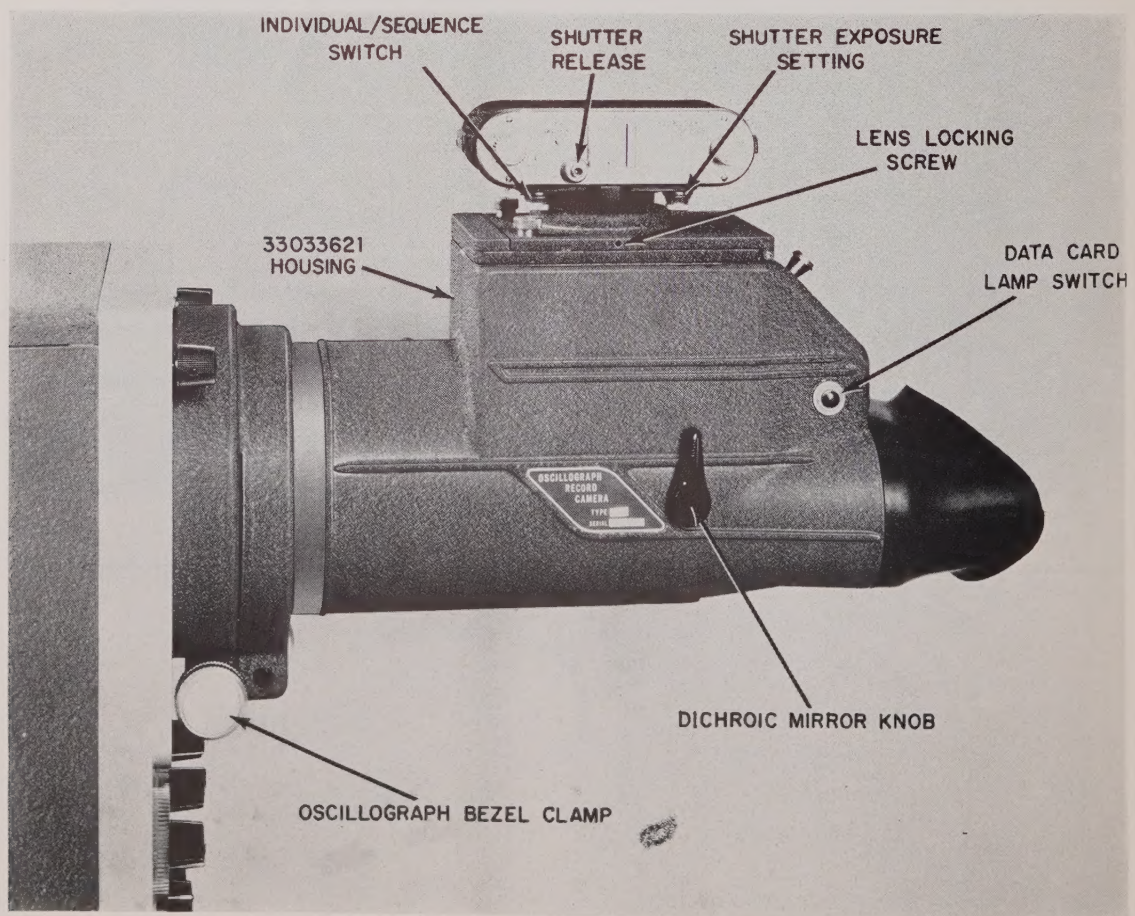

Figure 2-1. Type 352 Oscillograph-record Camera—Left Side

ton switch on the side of the housing is used to illuminate the written information. An additional small mirror (Figure 2-2) is included in the housing to reflect the light from the data card to the camera film.

For lens adjustment and servicing, an access door is located at the side of the housing. During normal picture taking, this door and that sealing off the optical viewing path should be closed.

For recording the cathode-ray tube patterns at the highest possible writing rates, the Type 352 Oscillograph-record Camera is equipped with a Robot "Recorder" camera. This camera is fitted with a spring-wound automatic film advance capable of transporting from one to twenty-four frames of film with one winding. Within the limit of the spring motor, the "Recorder" may be set to take a sequence of pictures automatically as long as the shutter release is held operated. The accessory Type 2633 Spring Booster Motor is available to extend the number of pictures that can be taken in this manner.

The rate at which sequence exposures can be made is dependent upon the shutter setting; for example, at 1/500 second shutter speed, 6 photographs may be made in one second. In general, the maximum writing rate capable of being photographed is about 75 inches per micro second using a P11 screen on a cathode-ray tube with a 9-Kv accelerating potential.

Remote operation of the camera is made possible by means of the accessory electrically-operated Type 2634 Solenoid. The Solenoid is constructed to permit manual operation of the shutter release without its removal. Using parallel-connected solenoids permits the taking of pictures in cameras on several oscillographs simultaneously.

For synchronizing the oscillograph to the camera operation, an accessory cord makes available the flash contacts of the camera. Full details of the accessories listed in this Manual are available from their separate instruction sheets.

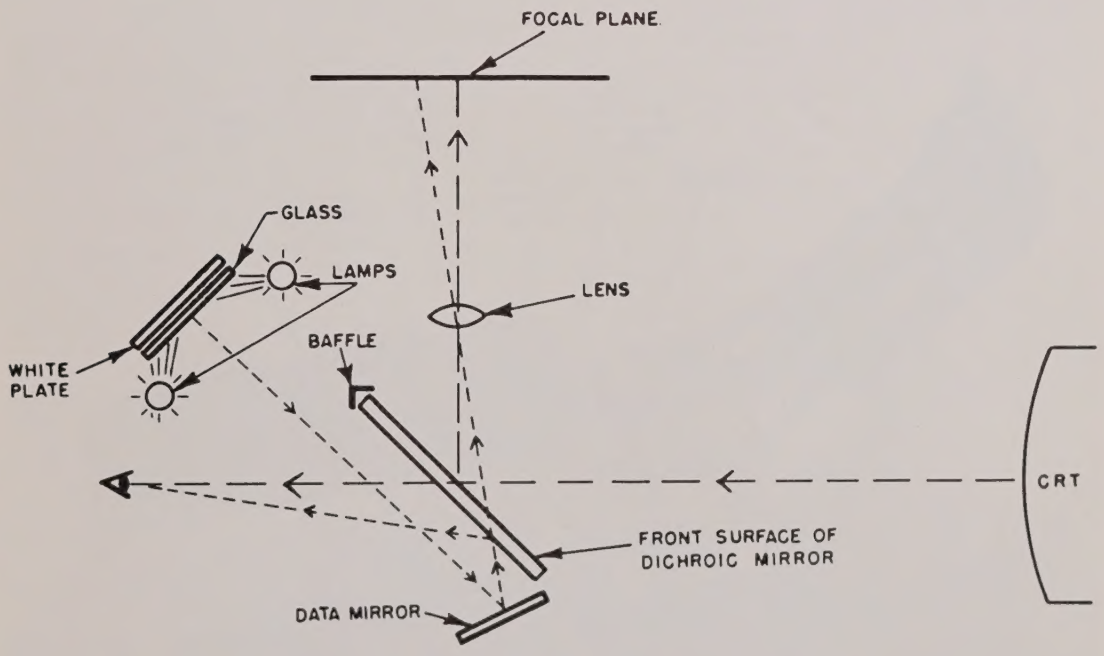

Figure 2-2. Optical System

SECTION 3
OPERATION

3. OPERATION

3-1. Preliminary Inspection

The following inspection procedure is suggested before mounting the camera on the oscillograph:

1. Open the viewing door and examine the dichroic and data-card mirrors for surface dust. Clean only with a fine camel-hair brush. The mirrors should not be moved or removed while cleaning.
2. Open the lens-access door and check the operation of the iris diaphragm.
3. To install the dry cell, open the data-record door and remove the two screws on the rear data card door assembly.
   Lift out the assembly exposing the data-record compartment.
   Snap the dry cell in place and check the operation of lamps by depressing the red push-button switch.
   Replace the assembly and screws.

3-2. Mounting the Type 352 Camera on an Oscillograph

Step 1. Remove the adapter clamp ring from the

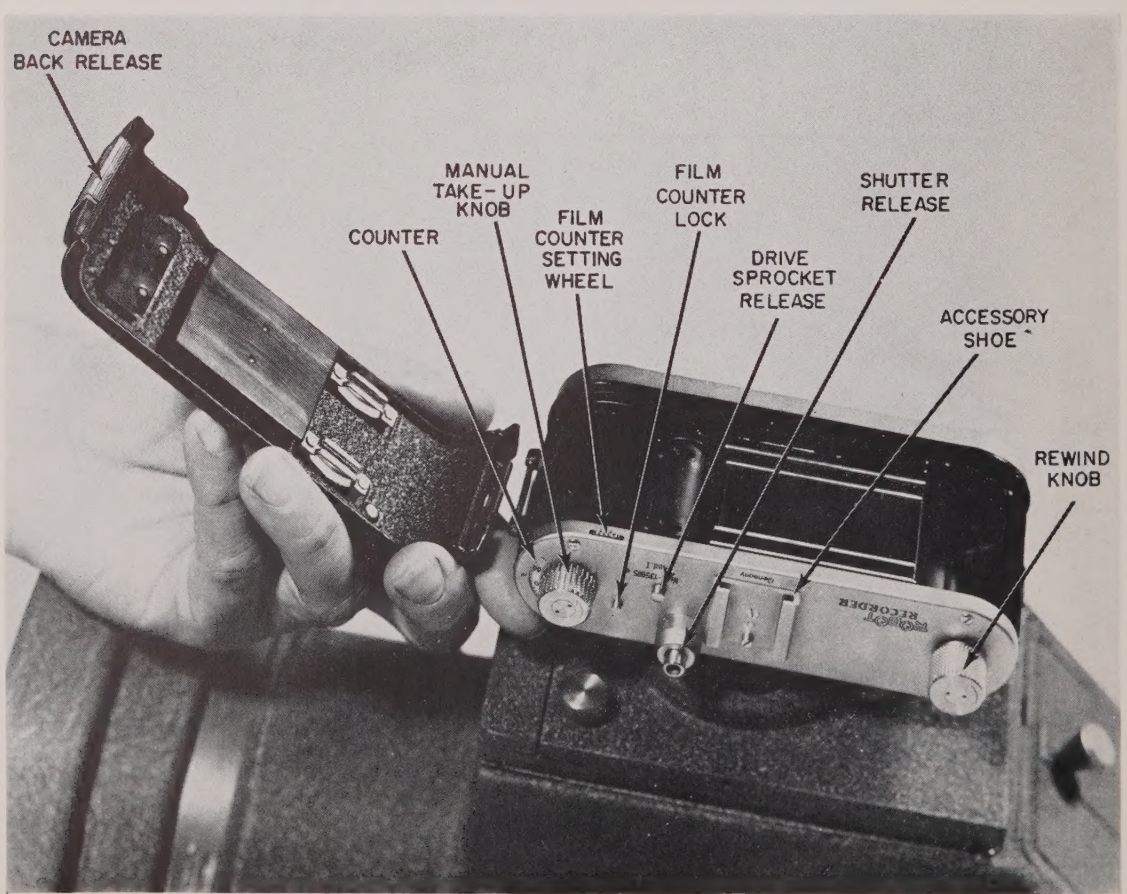

Figure 3-1. Camera Back Removed

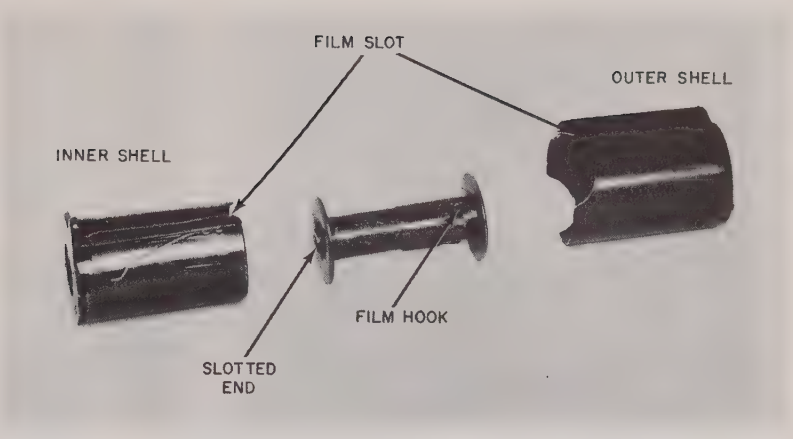

Figure 3-2.
Type 2636
Take-up Cassette

camera housing and secure it to the bezel of the oscillograph.

Step 2. Insert the camera housing into the adapter clamp ring and press firmly against the face of the cathode-ray tube or scale if present. Secure the adapter clamp ring by turning the knurled knob counterclockwise.

It is not necessary to remove the camera assembly from the oscillograph when loading the film or when recordings are not being made. It forms a convenient viewing shield for observing the patterns on the cathode-ray tube in a brightly lighted room.

3-3. Loading the Camera

Step 1. Lift the grooved side of the CAMERA BACK RELEASE and fold the back up. For convenience, the back may be removed entirely (Figure 3-1).

Step 2. Pull out the MANUAL TAKE-UP KNOB and lock it in the opposite direction to the arrow. Remove the Take-up Cassette.

Step 3. Open the Cassette (Figure 3-2) by gripping the inner shell and turning it against the lever spring. Pull the shells apart. Do *not* pull the shells apart without turning as this may damage the velvet light trap in the film slots.

Step 4. Push the start end of the film under the spring of the spool and hook one hole of the perforations as shown in Figure 3-3. Reinsert the take-up spool in the shells so that the film is located in the

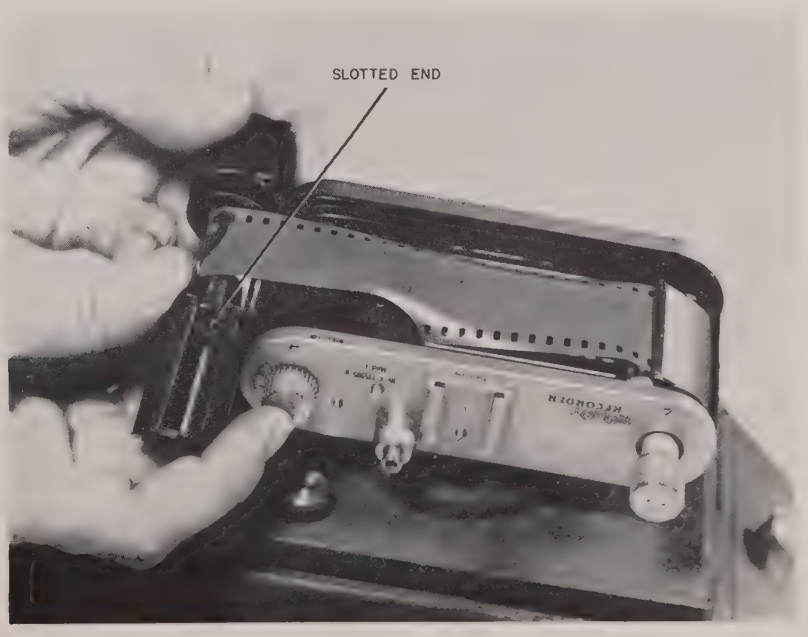

Figure 3-3.
Film Properly
Fastened to Cassette

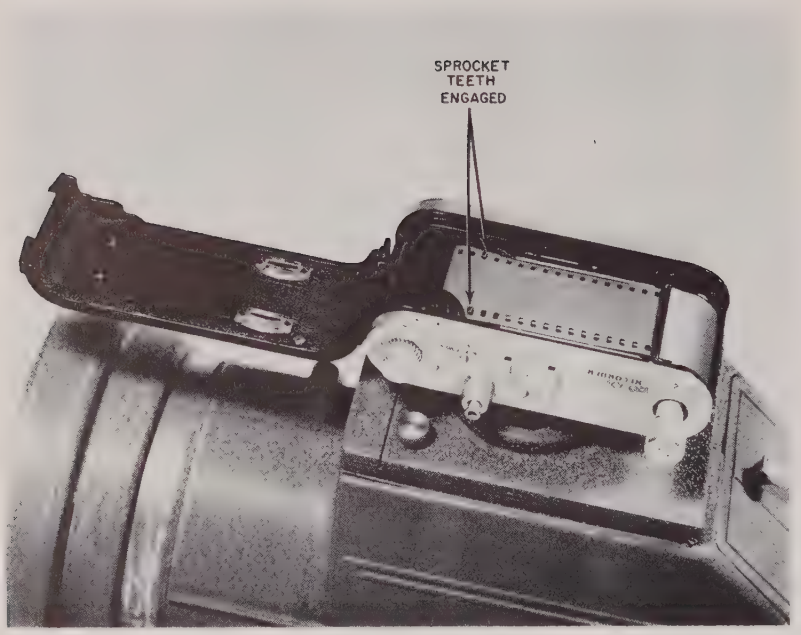

Figure 3-4. Film in Place, Sprocket Engaged

slots. As above, make sure that the shells are put together with the velvet strips apart.

Step 5. Insert the cartridge and the Take-up Cassette into the camera. The cartridge should be inserted obliquely. The take-up cassette should engage the notch correctly. Check that the emulsion is on the lens side of the film.

Step 6. Turn the TAKE-UP KNOB in the direction of the arrow, push in, and continue turning until the shaped leading end of the film has disappeared into the take-up cassette. Make sure that the sprocket teeth engage the film (Figure 3-4).

Step 7. Replace the back on the camera. Check that it fits tightly.

Step 8. Using the SPRING MOTOR WINDER (Figure 1-1), wind it up tightly. Set the INDIVIDUAL/SEQUENCE SWITCH to "Individual" (E). Press the SHUTTER RELEASE KNOB three times to advance the film to the proper point for the first picture (see Figures 2-1 and 3-1).

Step 9. Depress the FILM COUNTER LOCK and set the counter to "O" by means of the FILM COUNTER SETTING WHEEL.

Step 10. Rewind motor tightly again. It is recommended that the spring motor be kept wound tightly at all times so that the camera will be ready for use instantly.

3-4. Taking the Picture

Due to the wide variations in the brightness of the cathode-ray tube pattern as affected by the anode voltage, intensity control setting, type of screen, etc., it is recommended that test pictures be taken to determine the most useful settings for the f-stop and the shutter exposure time. Figure 3-5 shows a properly photographed waveform with the data card and scale information superimposed.

When taking pictures in the Sequence (S) position, use only those shutter speeds marked in red.

The focus of the lens is factory set and should not require adjustment. Maintenance Section 4-3 provides the detailed description of focus setting if it should ever be required.

The instructions to follow are divided into three sections for simplicity of explanation. Because the film is transported automatically when the SHUTTER RELEASE BUTTON is depressed, it is necessary to hold the DRIVE SPROCKET RELEASE down whenever the oscillogram, the illuminated scale and data card information are all to be recorded on the *same* frame of film. Full details of this procedure are provided in the steps listed.

A. Recording an Oscillogram ONLY

Step 1. Set the exposure time as determined by the test pictures suggested above.

Step 2. Open the housing access door and set the f-stop as determined by the test pictures suggested above. Close the access door.

Step 3. Set the INDIVIDUAL/SEQUENCE

SWITCH to the position desired (E-Individual, S-Sequence).

NOTE CAREFULLY

NEVER OPERATE THE MECHANISM IN THE SEQUENCE POSITION (S) WHEN FILM IS NOT THREADED IN THE CAMERA.

Step 4. Depress the SHUTTER RELEASE BUTTON to take the pictures. The spring motor will automatically advance the film, the film counter will indicate the number of pictures taken.

As the "Recorder" camera produces square pictures, 15/16 x 15/16 inch, the usual commercial cartridges labelled for 20 or 36 exposures, develop to 30 or 55 pictures respectively.

Remember to rewind the spring motor before 24 pictures have been taken, otherwise the motor will run down and at least one frame may be lost.

B. Recording an Oscillogram with Data Information on the Same Frame

Using a soft pencil, write the data to be recorded on the white card inside the data-card door. The camera will reproduce the writing on the film below the oscillogram properly orientated to the recorded waveform. The writing will be photographed when the DATA CARD LAMP SWITCH shown in Figure 2-1 is depressed.

Depending on the film used, the lamp is held on for the proper exposure time. As for the oscillogram itself, some test exposures should be made to determine the proper exposure for the lens aperture and the film in use.

Because the recording of the data information requires two buttons to be held down simultaneously, take the *data information last*, so that the DRIVE SPROCKET RELEASE BUTTON does not have to be held down at the same time.

Step 1. To take the picture of the oscillogram, follow the instructions of procedure A above,

EXCEPT: *HOLD DOWN THE DRIVE SPROCKET RELEASE BUTTON* to prevent film transport while depressing the SHUTTER RELEASE BUTTON.

Step 2. Release the buttons.

Step 3. To take the picture of the data, set the SHUTTER EXPOSURE to "Bulb" (B), depress the SHUTTER RELEASE BUTTON and operate the LAMP SWITCH for the time determined by the test exposures.

Step 4. Release the SHUTTER RELEASE BUTTON. The film will be transported to the next picture-taking position.

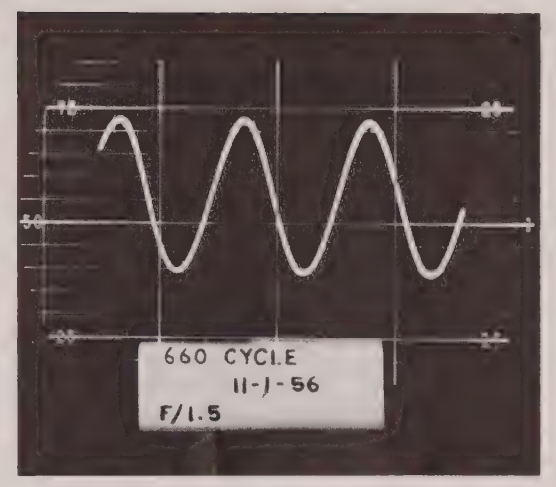

Figure 3-5. Typical Recording of Waveform with Data Card and Scale Information

C. Recording an Oscillogram with Data Information and an Illuminated Scale on the Same Frame

As for the data information, the exposure time required for recording the scale will depend upon the film used. Test exposures should be made to determine the proper f-stop and illumination time for best results.

For the same reason as described in procedure B above, take the data information last, so that the DRIVE SPROCKET RELEASE BUTTON does not have to be held down in addition to the SHUTTER RELEASE BUTTON and the LAMP SWITCH.

Step 1. To take the picture of the scale, set the SHUTTER EXPOSURE to "Bulb" (B). *HOLD DOWN THE DRIVE SPROCKET RELEASE BUTTON* to prevent film transport, then depress the SHUTTER RELEASE BUTTON for the time determined by the test exposures.

Step 2. Release all buttons.

Step 3. To record the data information and the oscillogram, follow the instructions of procedure B above.

3-5. Oscillograph Synchronization to the Camera

While the specific application cannot be outlined, the diagram of Figure 3-6 shows the general connections to be made to allow the Type 352 Camera to initiate the signal to be recorded as well as the sweep of the oscillograph.

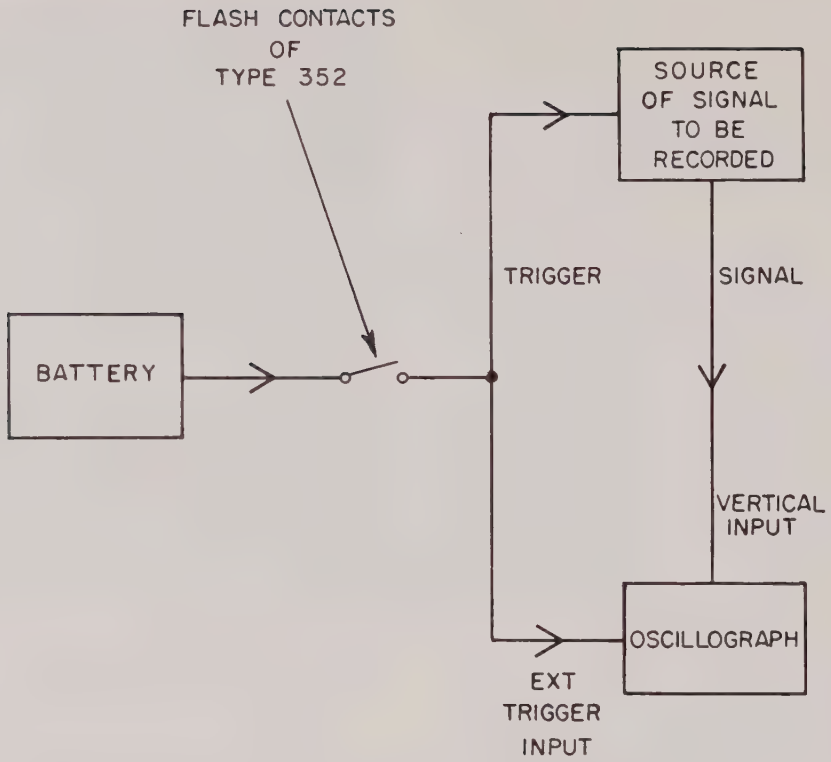

Figure 3-6. Setup for Synchronizing Oscillograph to Camera

Connect the battery through the flash contacts of the Camera (either the "X" or "M" contacts can be used) to the unit developing the waveform to be recorded, and to the external trigger input of the oscillograph. Set up the oscillograph controls so that the developed trigger will produce a sweep when it is applied.

For the connection to the flash contacts of the Camera, use the accessory Type 2637 Flash Cord. The end of this Cord is equipped with a standard ac line plug to be used as desired in the particular setup of equipment.

3-6. Rewinding the Film

Note that the Type 2636 Take-up Cassette is light-tight. For speed in film changing, rewinding is unnecessary, simply transport the film all the way into the cassette, open the back, remove both the empty cartridge and the full cassette, then reload as described in Section 3-3 above, using another Take-up Cassette.

If rewinding is desired (see Figure 3-1):

Step 1. Turn the REWIND KNOB in the direction of the arrow, pulling slightly outwards at the same time. Depress the DRIVE SPROCKET RELEASE BUTTON and rewind the film until the film counter shows "0".

Step 2. Continue to rewind *slowly* until a resistance is felt. Do not force beyond this point.

Step 3. Turn the REWIND KNOB in the opposite direction to the arrow until it has retracted. Open the back of the camera and remove the cartridge and the cassette. Open the cassette and disengage the film perforation from the hook.

Step 4. Before reloading, check that any torn bits of film have been removed. Reload as described in Section 3-3.

SECTION 4
MAINTENANCE

4. MAINTENANCE

4-1. General

The Type 352 Camera should be handled with the same care given to all fine optical equipment. Under no circumstances should an attempt be made to force-fit parts.

The focus should not be readjusted unless there is reason to believe from observing recordings that the camera is out of focus.

For the majority of the work, the depth of field of the lens is sufficient to accommodate curved-face cathode-ray tubes with the aperture wide open or with screens and filters inserted between the camera housing and cathode-ray oscillograph screen.

For any servicing beyond the obvious simple repairs, it is recommended that the Camera be returned to the Factory Instrument Service, Allen B. Du Mont Laboratories, Inc., 760 Bloomfield Avenue, Clifton, New Jersey.

4-2. Preventive Maintenance

a. Lens, Shutter and Mirrors

The lens and shutter mechanisms have been carefully inspected at the factory. Should they become defective at any time, the entire camera should be returned to the factory for repair. Shutter repairs should not be attempted except by experienced camera technicians.

It may occasionally be necessary to remove dust particles from the dichroic and data-record mirrors or from the surface of the lens. These surfaces should be cleaned by dusting with a soft camel hair brush. The use of a lens cap is recommended.

b. Lubrication

This equipment requires no lubrication. NEVER OIL OR LUBRICATE THE SHUTTER MECHANISM.

c. Dry Cell Replacement

The dry cell, located in the data-record compartment, should be replaced whenever the exposure time for making suitable data records becomes appreciably higher. To install the dry cell, the following procedure is recommended.

Step 1. Open the data-record door and remove the two screws located on rear data card door assembly.

Step 2. Lift out the assembly exposing the data-record compartment.

Step 3. Snap the dry cell in place and check the operation of the lamps by depressing the LAMP SWITCH.

If the camera is stored for long periods of time it is advisable to remove the dry cell to prevent possible damage due to leakage.

d. Adapter Clamp Ring

Since the camera housing is of die-cast construction, excessive expanding or tightening of the adapter clamp ring should be avoided. Expanding the adapter clamp ring too far will cause the retainer rings to spring out of their grooves. Excessive tightening may crack the die-casting.

e. Storage

When the camera is not in extended use it is suggested that it be stored in its carrying case or covered with a plastic bag.

4-3. Refocusing

The lens of the camera has been set at the factory to be in optimum focus when the rubber trimmed end of the camera housing is in contact with the face of the cathode-ray tube.

If refocusing is necessary, proceed as follows:

Step 1. Mount the camera on the oscillograph.

Step 2. Open the back of the camera.

Step 3. Set the SHUTTER EXPOSURE to "Bulb" (B). Open the housing access door and set the lens aperture to the lowest f-number (largest lens opening).

Step 4. Set the oscillograph to obtain a sharply focused stationary pattern centered on the cathode-ray tube screen.

CAUTION

To prevent damage to the screen of the cathode-ray tube, open the viewing door and observe pattern while making intensity adjustments. Keep intensity low.

Step 5. Place a sheet of ground glass, $1\frac{3}{8}$ inches x $1\frac{3}{8}$ inches at the focal plane where the film would be located, with the ground surface towards the lens.

Step 6. Depress the SHUTTER RELEASE and observe the oscillograph pattern on the ground glass.

Step 7. If the focus is incorrect, loosen the LENS LOCKING SCREW (Figure 2-1), open the housing access door, and turn the lens in its housing mounting until the picture on the ground glass is in perfect focus. Lock the lens in place with the LENS LOCKING SCREW.

Step 8. When the lens is refocused, check the focus of the data-card image. Readjust the data mirror as required to locate the image in the focal plane. For ease in adjustment, remove the Type 352 from the oscillograph and reach the data mirror mounting screw through the clamp ring end of the housing. To change the angle of this mirror, remove it from the housing entirely and bend the mounting bracket as necessary. CAUTION: Do not touch the surface of the mirror.

4-4. Removing the Camera from the Housing

To release the camera from the housing, move the LOCKING LEVER (Figure 4-1) towards the SPRING MOTOR WINDER. Lift camera straight out.

When replacing, locate the camera so that the red dots on it and on the housing come together.

4-5. Replacement Parts

The accompanying photographs show the Du Mont Part Numbers and the names of all replaceable parts.

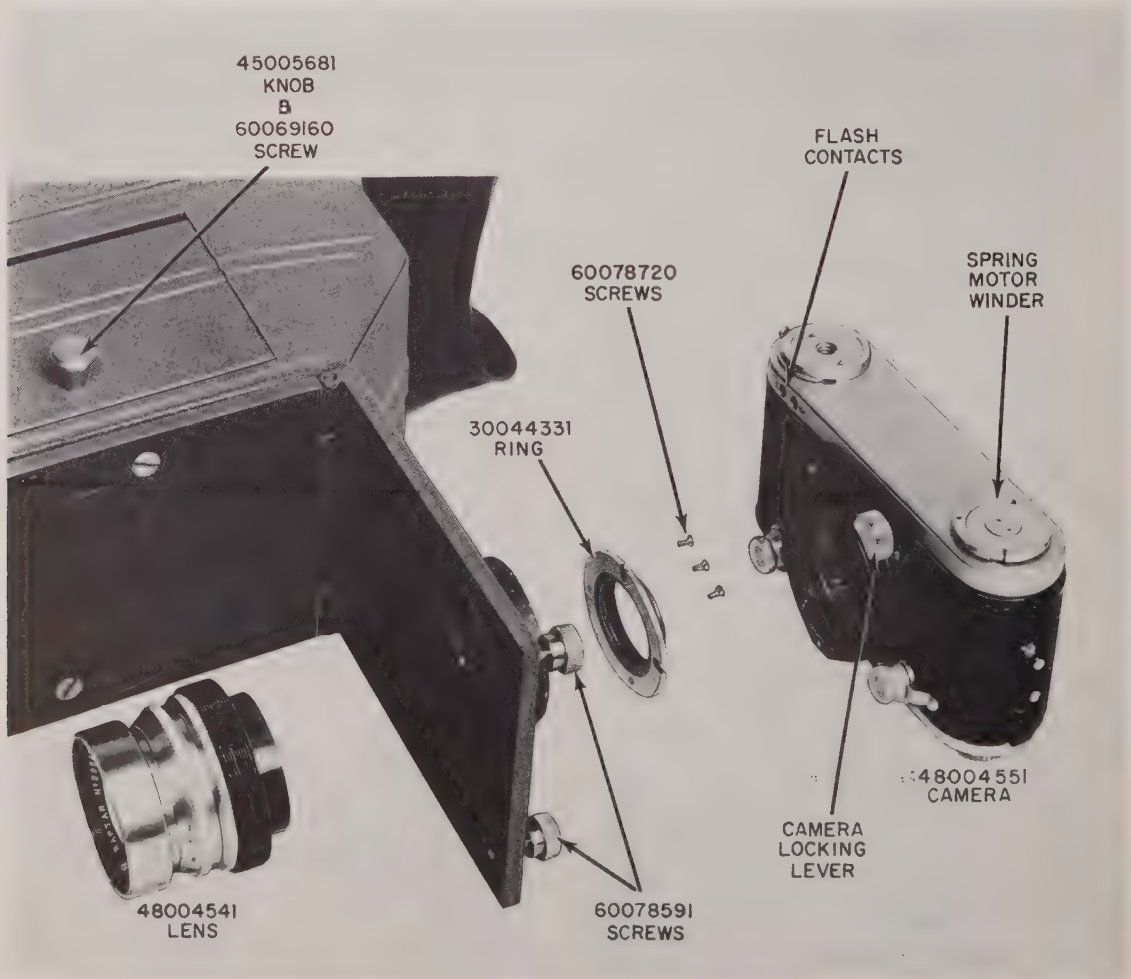

Figure 4-1. Camera and Lens Assemblies

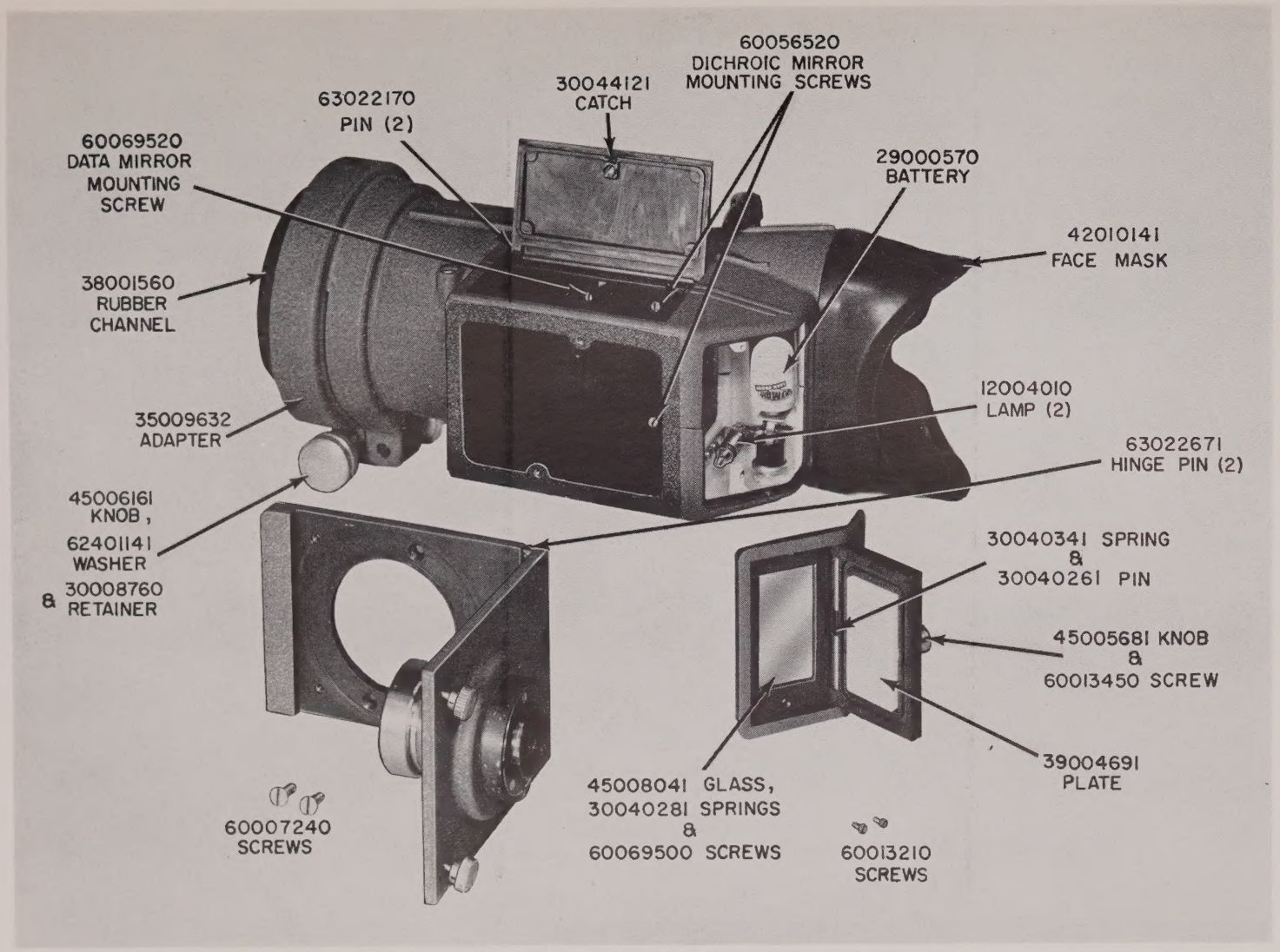

Figure 4-2. Camera Mount and Data Card Assemblies

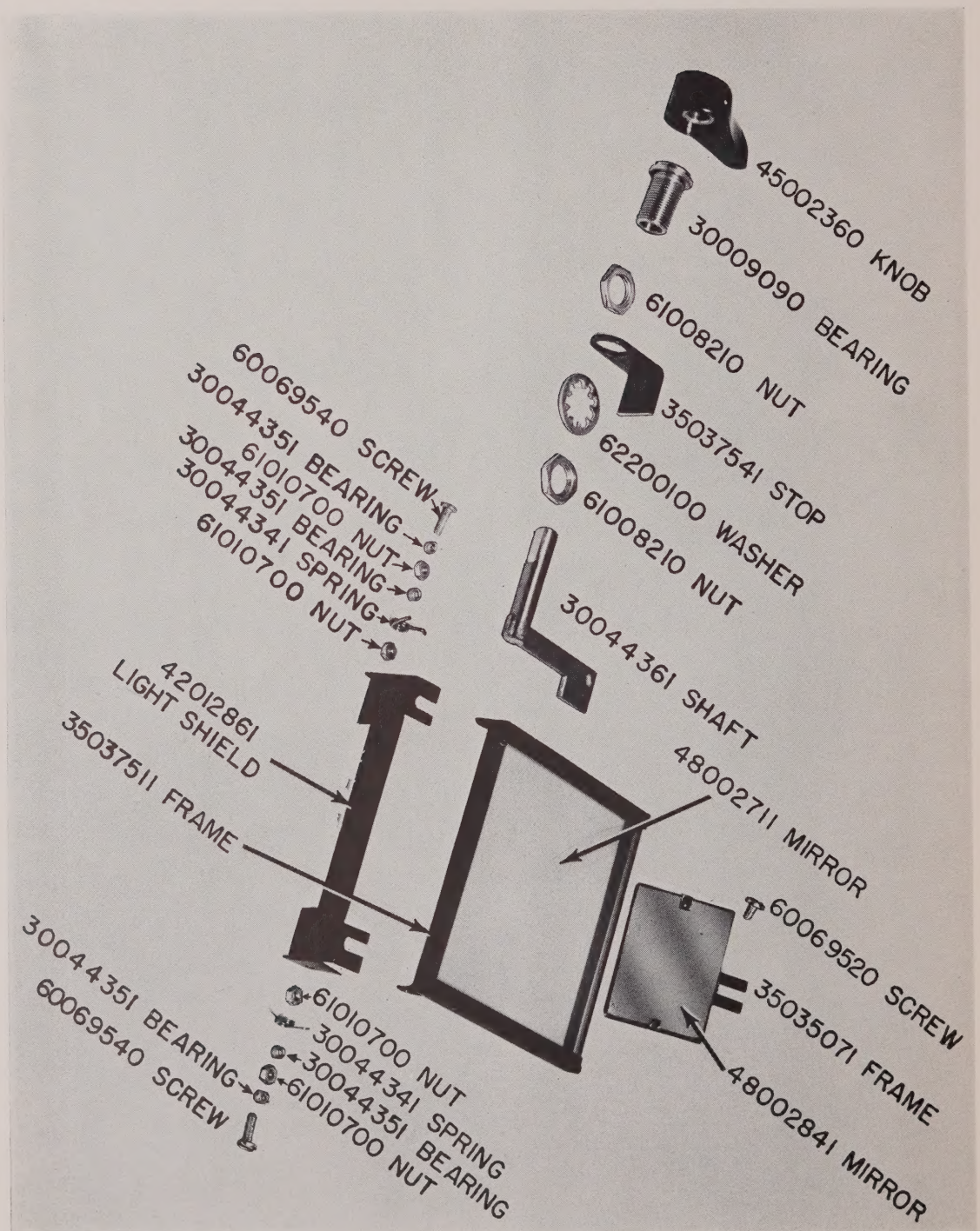

Figure 4-3. Mirror Assemblies

WARRANTY AND SERVICE NOTICE
for
Industrial Type Cathode-ray Tubes and Instruments

DU MONT INSTRUMENTS

Each instrument manufactured by the Technical Products Division of Allen B. Du Mont Laboratories, Inc., is guaranteed to equal or exceed its published performance specifications. It is further guaranteed against defective materials (other than the cathode-ray tube) and workmanship for a period of one year from delivery date. Any defective instrument or an instrument that does not meet or exceed our specifications will, upon inspection by us, be repaired or replaced at our discretion should such defect appear within the guarantee period.

To register this guarantee, the enclosed guarantee card must be properly filled out and mailed to the factory immefiately upon receipt of the equipment. Complete information is necessary. BOTH THE TYPE NUMBER AND THE SERIAL NUMBER OF THE INSTRUMENT MUST BE GIVEN ON THIS CARD.

Instruments must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

DU MONT CATHODE-RAY TUBES

Industrial type cathode-ray tubes manufactured by Allen B. Du Mont Laboratories, Inc., are guaranteed for 1000 hours of operation or for a six-month period from date of shipment, whichever expires first. Adjustments will be made on the merit of each individual claim because of the widely varying applications to which such tubes are subjected, and a tube which becomes defective during the guarantee period will be replaced ONLY AFTER INSPECTION AT THE FACTORY. Cathode-ray tubes returned under the guarantee, must be shipped with transportation paid.

BURNED-OUT HEATERS AND BROKEN GLASS ARE NOT COVERED BY THE TUBE GUARANTEE

To register a tube guarantee, the guarantee card enclosed with the tube must be filled out properly and mailed to the factory immediately upon receipt of the equipment. Complete information is necessary. TYPE NUMBER AND SERIAL NUMBER OF THE CATHODE-RAY TUBE MUST BE INCLUDED. The serial number of the tube will be found either on the glass stem of the electron-gun structure or on the bulb near the Du Mont brand. Tubes must be examined immediately upon receipt, since claims for damage in transit will not be honored by the carrier unless prompt action is taken.

CHANGES IN SPECIFICATIONS

The right is reserved to change the published specifications of equipment at any time and to furnish merchandise in accordance with current specifications without incurring any liability to modify equipment previously sold, or to supply new equipment in accordance with earlier specifications excepting under the classification of special apparatus.

SERVICE

In order to insure factory service under our guarantees, the guarantee cards enclosed with all instruments and tubes must be properly filled out and returned. In all cases where service or adjustment is requested, please write first to the factory giving complete information concerning the nature of the failure and describing the manner in which the equipment was used when failure occurred. THE TYPE NUMBER AND SERIAL NUMBER of the equipment must also be given. In this way, much time can be saved and unnecessary inconvenience often avoided. When writing in this respect, address:

Allen B. Du Mont Laboratories, Inc.
Technical Products Division
760 Bloomfield Avenue, Clifton, New Jersey

The Technical Products Division will then send to the customer, the written procedure for sending the instrument back to the factory. All equipment should be packed and shipped in accordance with this procedure; and identification tags should be attached to each tube or instrument.

REPLACEMENT PARTS

If it is necessary to order a replacement component from the factory, always give the type number and serial number of the instrument and refer to the component by its symbol designation and description on the circuit schematic. This will help to expedite service.

DUMONT

Additional copies of this manual may be secured at a cost of two dollars each or twenty dollars per dozen copies; postpaid in the United States of America only.

Allen B. DuMont Laboratories, Inc.

TECHNICAL PRODUCTS DIVISION

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